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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/596,022	05/25/2006	Toshiharu Furukawa	FIS920030339US1	1812

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INTERNATIONAL BUSINESS MACHINES CORPORATION  
DEPT. 18G  
BLDG. 321-482  
2070 ROUTE 52  
HOPEWELL JUNCTION, NY 12533

EXAMINER
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GEBREYESUS, YOSEF

ART UNIT	PAPER NUMBER
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2811

NOTIFICATION DATE	DELIVERY MODE
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04/03/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

EFIPLAW@US.IBM.COM

<b>Office Action Summary</b>	<b>Application No.</b> 10/596,022	<b>Applicant(s)</b> FURUKAWA ET AL.	
	<b>Examiner</b> YOSEF GEBREYESUS	<b>Art Unit</b> 2811	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 May 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 May 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>5/25/2006</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the subject matter in claim 5 of “a separate trench conductor material” must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Claim 5 line 2 recites “a separate trench conductor material” which is not disclosed in the specification. Appropriate action is required.

### ***Claim Objections***

Claim 8 is objected to because of the following informalities: Claim 8, line 1 recites “the device” which appears to be “the trench type storage device”; it is suggested to change “the device” to “the trench type storage device” for clarity. Appropriate correction is required.

Claim 8 is objected to because of the following informalities: Claim 8, line 3 recites “nanotube” which appears to be “nanotubes”; it is suggested to change “nanotube” to “nanotubes”. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 5 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 recites "a separate trench conductor material". There is no language to provide structural relationship between "the trench conductor" and "a separate trench conductor material". Also, the claim does not recite that the trench-type storage device "further comprises a separate trench conductor material". It is not clear what the term "separate trench conductor material" is referring to. For the purpose of examination, the term "a separate trench conductor material" has been interpreted broadly. Appropriate action is required.

Claim 8 recites the limitation "the trench dielectric" in line 2. There is insufficient antecedent basis for this limitation in the claim. The limitation the "trench dielectric" is recited previously only in claim 2 not in claim 1. Appropriate action is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Hsu et al. (US 6,333,598, dated 12/25/2001, filed 01/07/2000).

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Regarding claim 1, figures 1, 30 and 31 of Hsu et al. discloses a trench-type device comprising: a substrate 12 (col. 11 line 17); at least one trench (cavity) in said substrate; conductive carbon nanotubes 22 (col. 10 lines 39-46) lining said trench (cavity); and a trench conductor (conducting protection layer) 55 (col. 14 lines 50-52) filling said trench (cavity).

The preamble “storage device” is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Regarding claim 2, figures 1 and 31 of Hsu et al. discloses, the device, further comprising a trench dielectric 16 (col. 11 lines 19-20) between said carbon nanotubes 22 and sidewalls of said trench.

Regarding claim 3, figure 31 of Hsu et al. discloses the device, characterized in that the conductive carbon nanotubes 22 form an open cylinder structure lining said trench.

Regarding claim 4, figures 30 and 31 of Hsu et al. discloses the device, characterized in that the trench conductor (conducting protection layer) 55 comprises a metal (Pt) (col. 14 lines 52-53).

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Regarding claim 5, in so far as can be understood according to the rejection made under 35 USC 112, second paragraph, figures 30 and 31 of Hsu et al. discloses the device, characterized in that the conductive carbon nanotubes 22 and a trench conductor material (Pt) 55 are disposed in the trench, and the trench conductor material 55 is carbon free (Pt).

Regarding claim 6, figures 30 and 31 of Hsu et al. discloses the device, characterized in that the substrate is free of carbon nanotube catalyst material (the catalytic material is removed by plasma) (col. 15 lines 65-67).

Regarding claim 7, figures 30 and 31 of Hsu et al. discloses the storage device, characterized in that the carbon nanotubes 22 form a consistent lining along approximately the entire length of sidewall of said trench.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu et al as applied to claim 1 above.

Regarding claim 8, in so far as can be understood according to the rejection made under 35 USC 112, second paragraph, figure 4(L) of Hsu et al. discloses all the claimed inventions except the top surface of the substrate is coplanar with respect top

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surface of the trench dielectric, the conductive carbon nanotubes and the trench conductor.

However, it would have been obvious to one ordinary skill in the art at the time of invention to modify Hsu et al.'s device by forming the substrate coplanar with respect top surface of the trench dielectric 16, the conductive carbon nanotubes 22 and the trench conductor 55 for the purpose of making miniature stackable devices and minimize manufacturing cost.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu et al. in view of Yoshikazu Homma et al. ("Growth of suspended carbon nanotube..." dated 09/16/2002, hereinafter Homma et al.) as applied to claim 1 above.

Regarding claim 9, Hsu et al. discloses all the claimed inventions except the conductive nanotubes are grown downwards into the trench.

However, in the same field of endeavor Homma et al. discloses growing nanotubes downward (page 2263, 5<sup>th</sup> paragraph).

Therefore, it would have been obvious to one ordinary skill in the art at the time of invention to form the carbon nanotubes of Hsu et al.'s device by growing downwards as taught by Homma et al. for the purpose of forming vertical nanotubes without arches at the top (page 2263 col. 2 lines 15-19).



***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YOSEF GEBREYESUS whose telephone number is (571)270-5765. The examiner can normally be reached on Monday through Thursday 7:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lynne A. Gurley/  
Supervisory Patent Examiner, Art Unit 2811

Yosef Gebreyesus  
3/18/2009

/Y. G./  
Examiner, Art Unit 2811